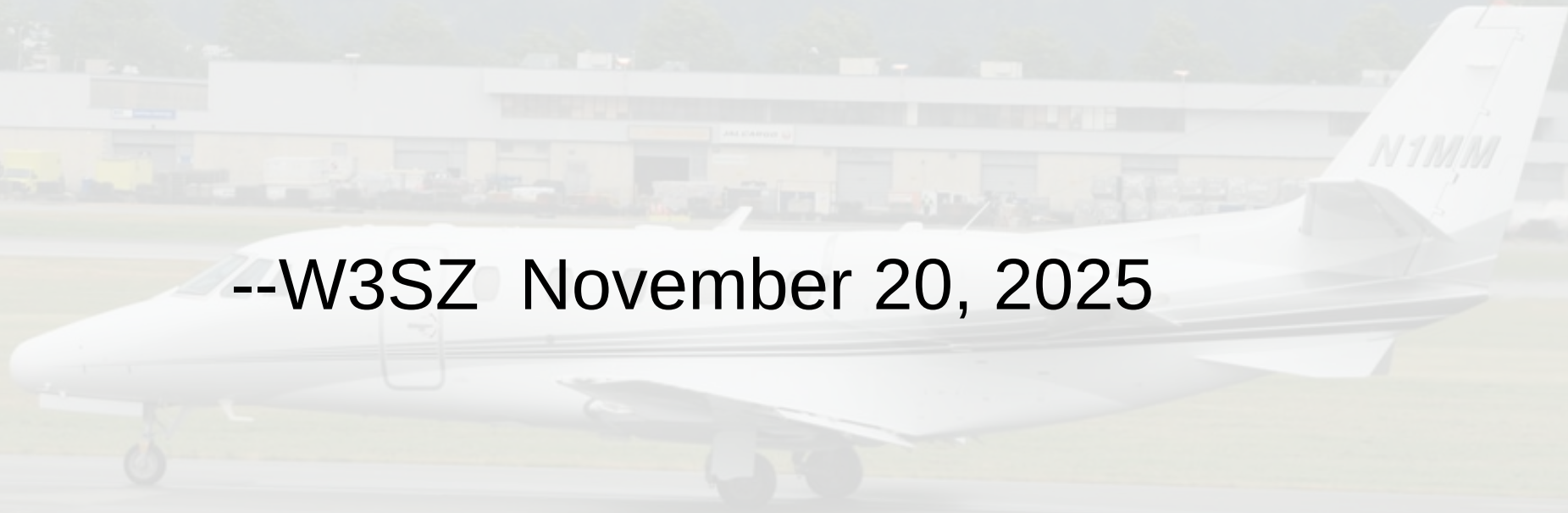


Digital on the Microwaves

--W3SZ November 20, 2025



Digital on the Microwaves

- Digital on the microwaves is NOT like digital on the lower 4
- You don't call CQ on 902 MHz and up
- Q65-15C is the go-to mode
- Do NOT use one of the “standard” frequencies for skeds; you want to avoid potentially getting interference
- ALWAYS put your QSO partner's call and grid into the DX Boxes on WSJTX (extra 3 dB)
- Make SURE you have Deep and Averaging enabled

Lower Four

- Stable freq, little spread (exception: Aurora)
- Don't need to be pointed at a station to work them
- Lots of stations to be heard on a single calling frequency

=> sit on the digital calling freq and CQ

Microwaves

- Less stable freq, Doppler shift with AS and shift & spread with RS
- Narrow beamwidths, need to be pointed at a station to work them
- Using a calling frequency / calling CQ doesn't work due to narrow beamwidths and fewer stations

=> arrange contacts via other means and move to a quiet frequency for QSO

Lower Four

- Use FT8. Call CQ and listen on:

50.313

144.174

222.174

432.174

- For weak-signal skeds follow uW prescription =>

Microwaves

- Use Q65-15C for a sked on a quiet freq arranged via cell, ON4KST, etc.
- Do NOT use one of the std freqs as that just invites interference while you are trying your sked.
- I tend to use an “odd” freq above the analog calling freq, e.g 902.153, 1296.147, 10368.134...



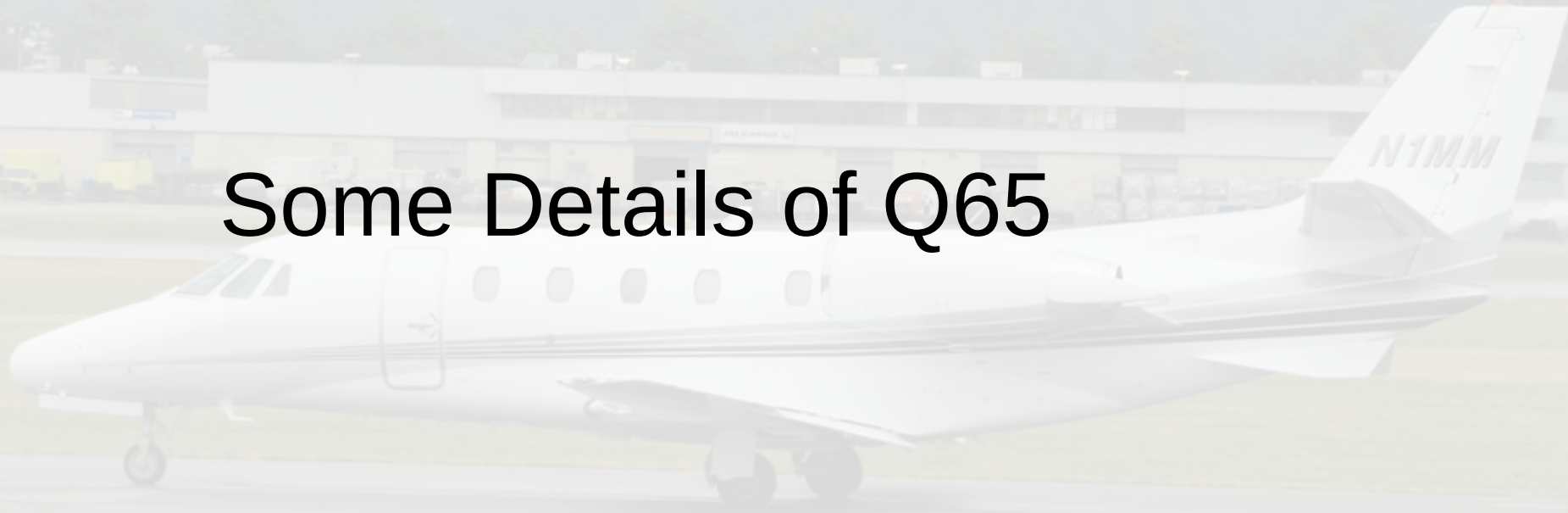
Calling CQ on
the lower 4
(especially
50.313)

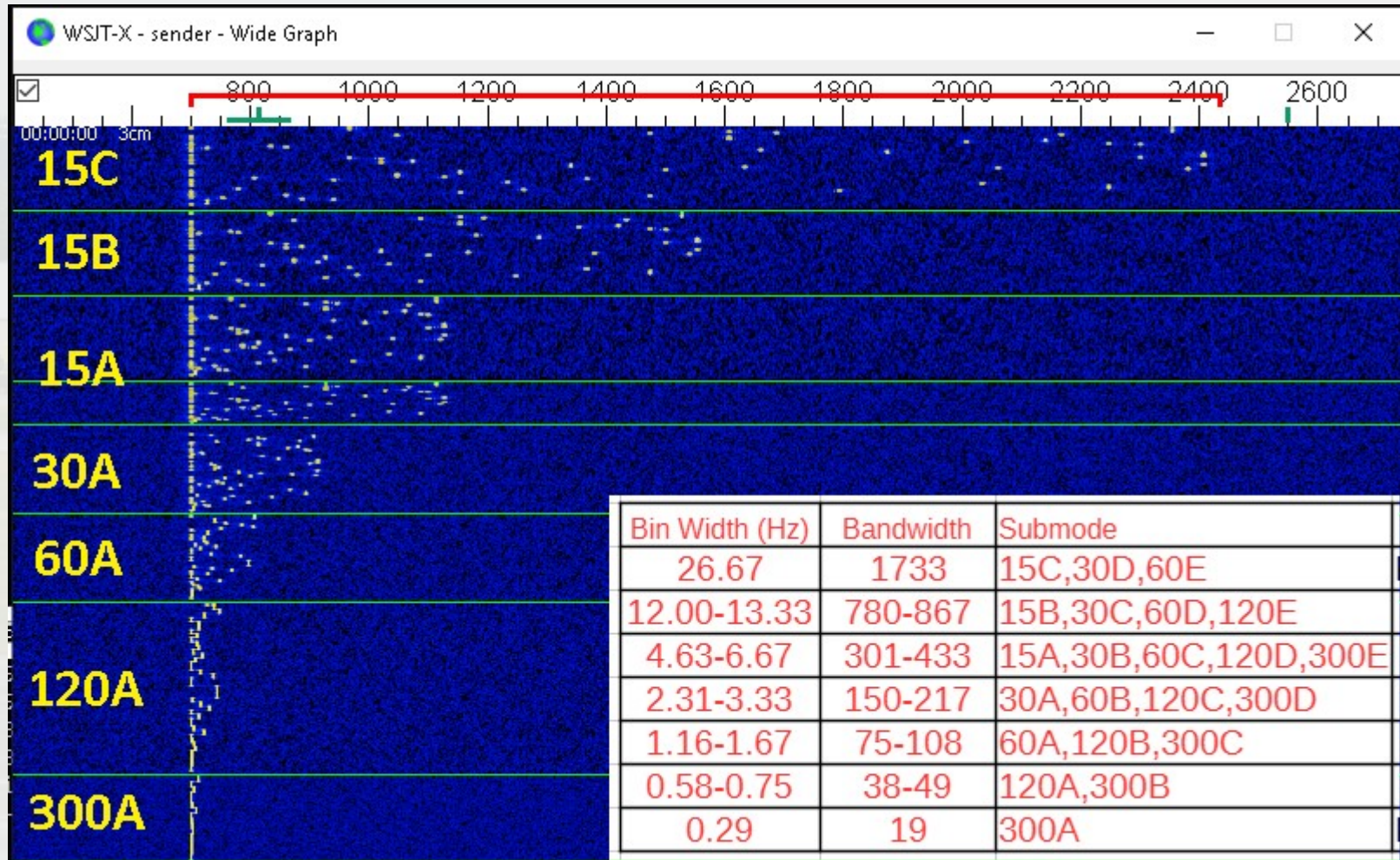


Calling CQ on
the
microwaves



Some Details of Q65

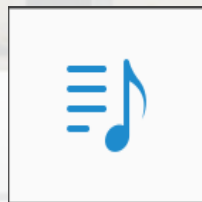




https://wsjt.sourceforge.io/Q65_Quick_Start.pdf

Play audio
clip

Q65-15C Audio Clip

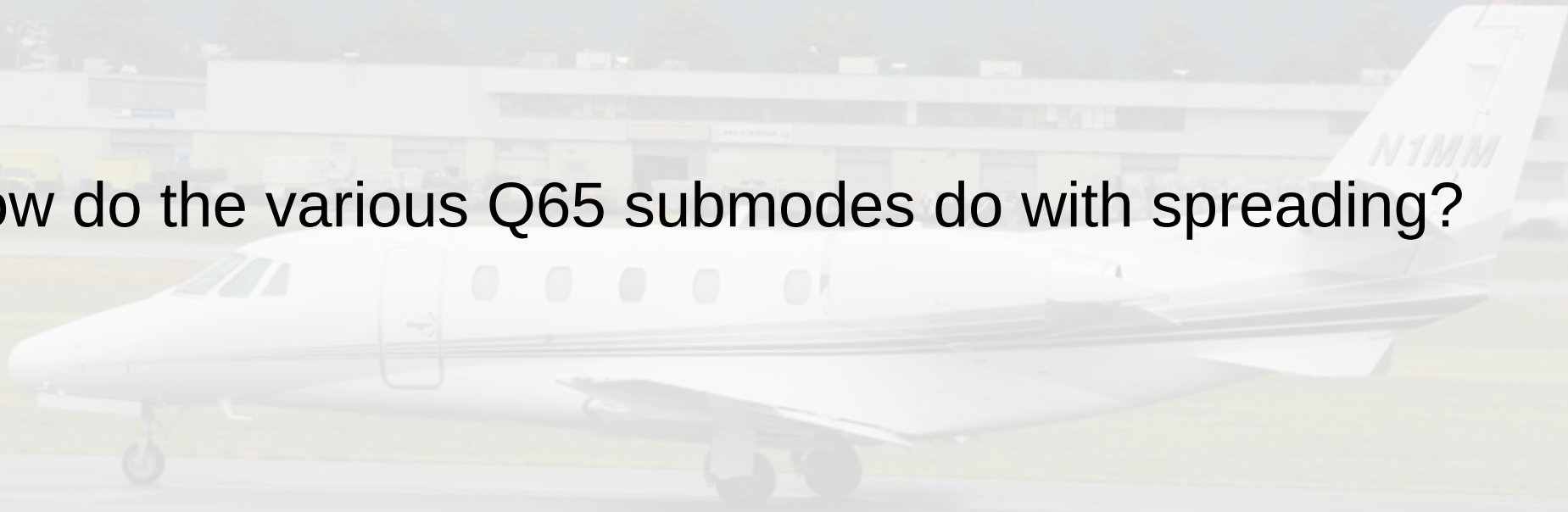


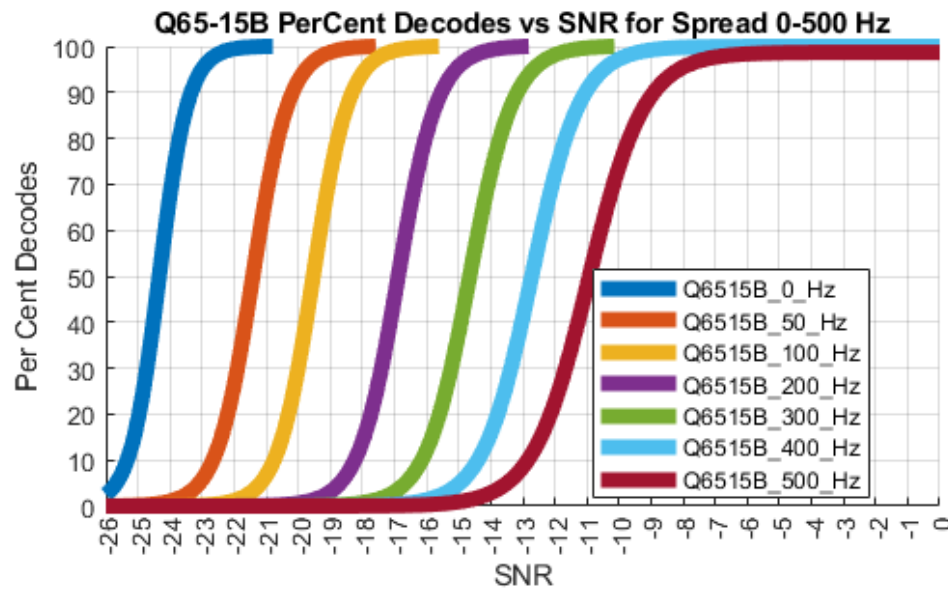
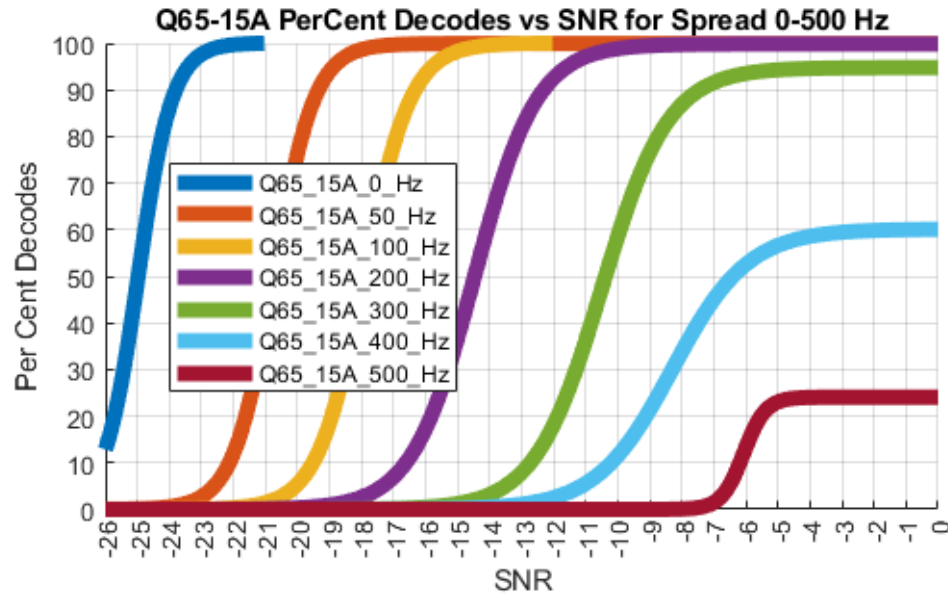
Mode	Tone Spacing (Hz)	BW (Hz)	S/N Shift 0 (Hz/s)	S/N Shift 0.7 (Hz/s)	S/N Shift 2 (Hz/s)	S/N Shift 4 (Hz/s)	S/N Shift 5 (Hz/s)	S/N Shift 10 (Hz/s)	S/N Shift 15 (Hz/s)	S/N Shift 20 (Hz/s)
Q65-15A	6.67	433	-23	-21	-18	X	X	X	--	--
Q65-15B	13.33	867	-22	-21	-20	X	X	X	--	--
Q65-15C	26.67	1733	-21	-20	-20	-19	X	X	X	--
Q65-15A #	6.67	433	-23	-21	-21	-21	-20	-19	-20	-18
Q65-15B #	13.33	867	-22	-22	-21	-21	-21	-21	-21	-21
Q65-15C #	26.67	1733	-20	-20	-20	-20	-20	-20	-20	-20
ISCAT-A-15	21.5	905	-16	-16	-15	-13	-12	X	--	--
ISCAT-B-15	43.1	1809	-15	-15	-15	-14	-13	-11	-10	-9
JT9-15E	25	225	-14	-14	-13	-12	-11	-9	X	X
JT9-15F	50	450	-13	-12	-12	-12	-11	-10	-10	-9
JT9-15G	100	900	-10	-11	-11	-10	-10	-9	-9	-9
JT9-15H	200	1800	-7	-7	-7	-7	-6	-7	-6	-7
MSK144	1000	2400	-9	-9	-9	-8	-8	-7	-6	-6
FT8	6.25	50	-20	-15	X	X	X	X	--	--

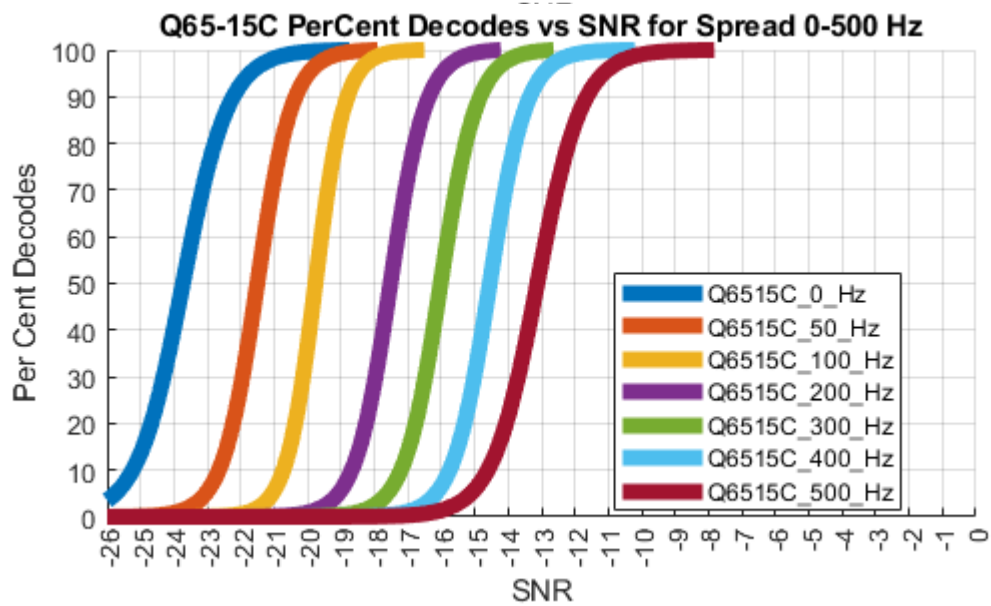
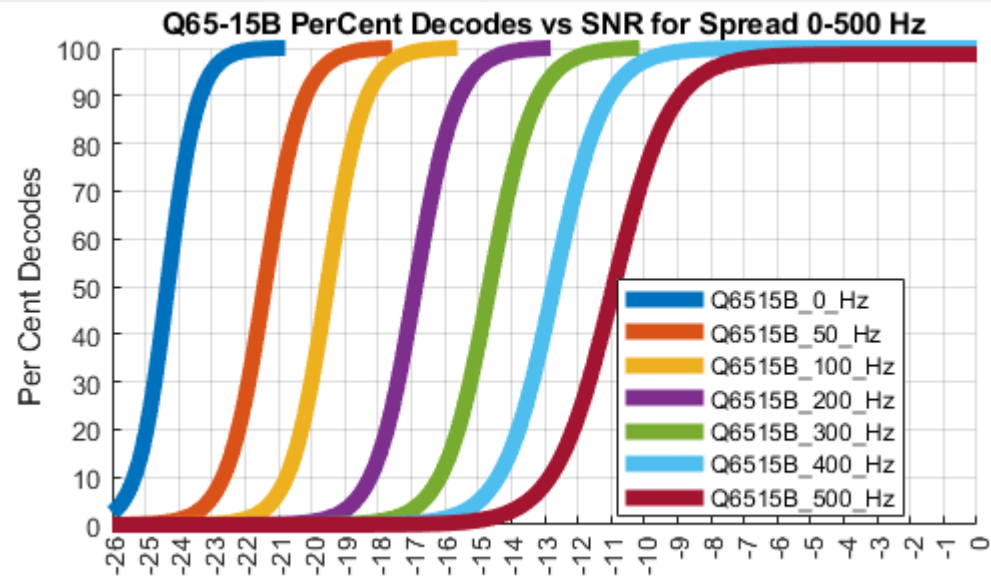
Why not FT8?

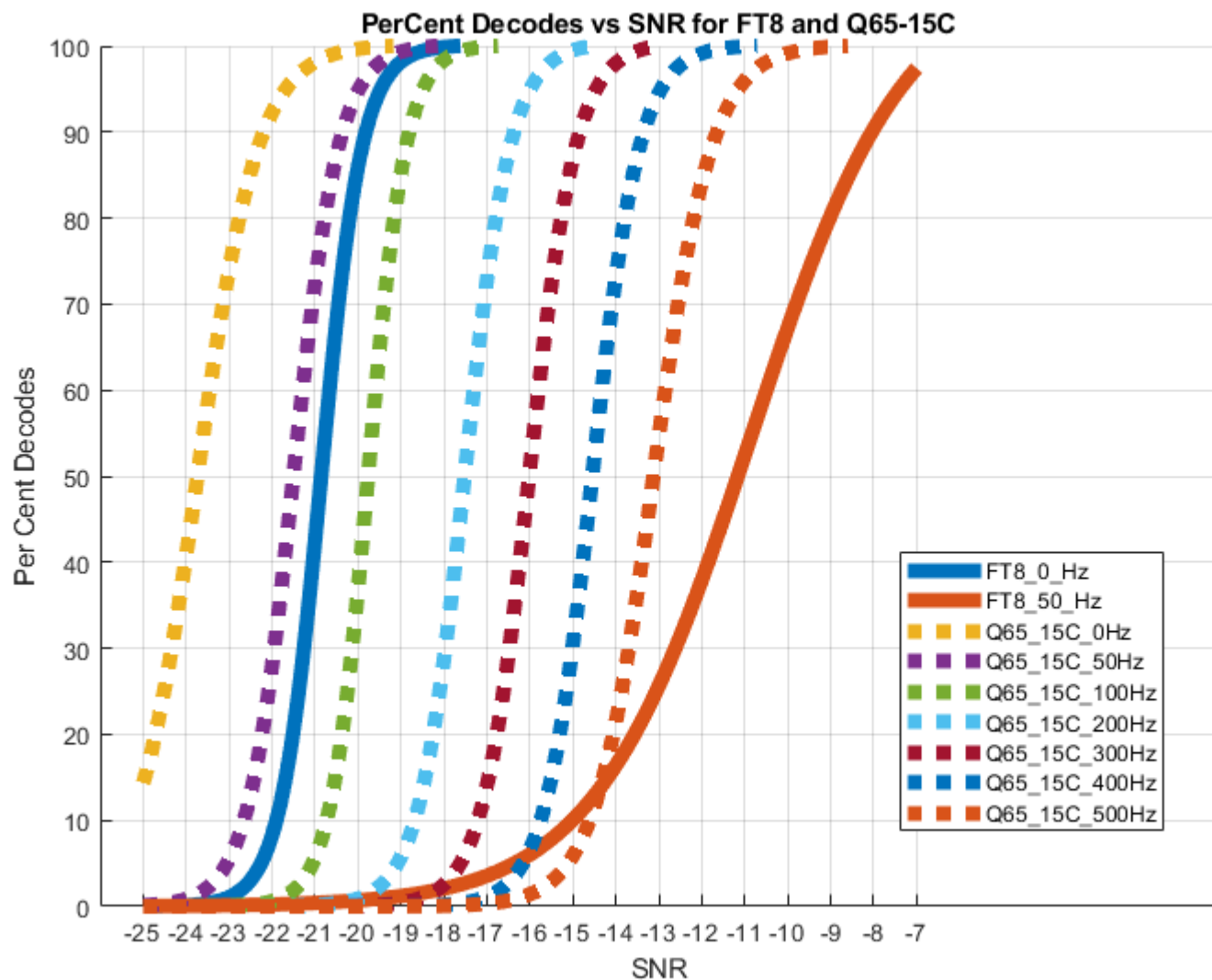
In terms of frequency shift / drift tolerance, FT8 is the worst of the listed modes. It was not designed to have remarkable shift/drift tolerance

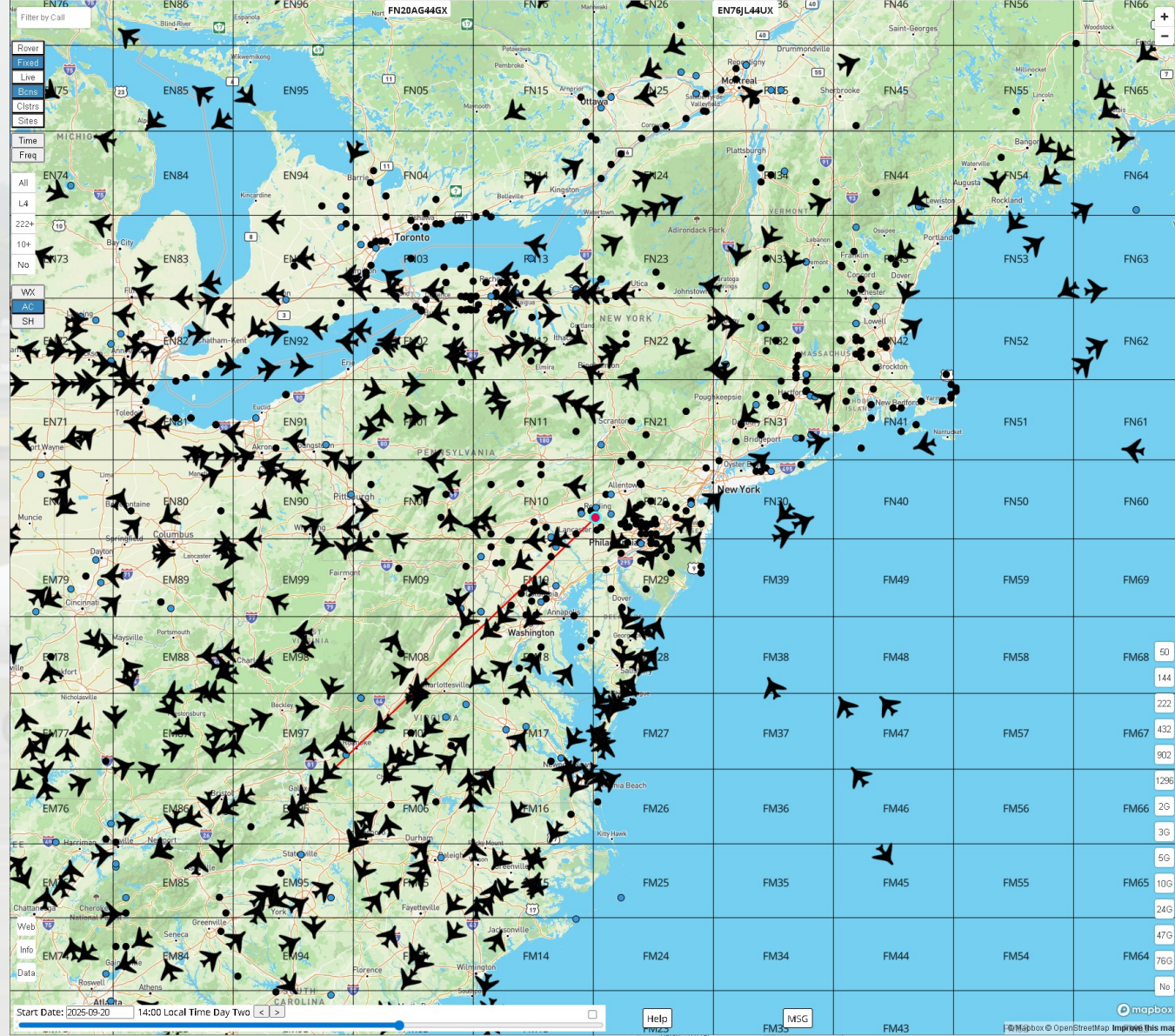
So how do the various Q65 submodes do with spreading?

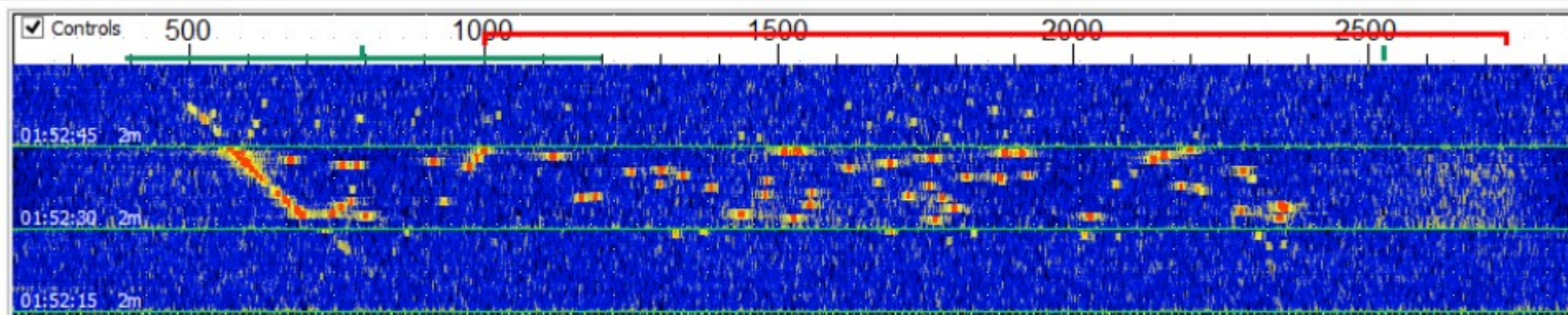






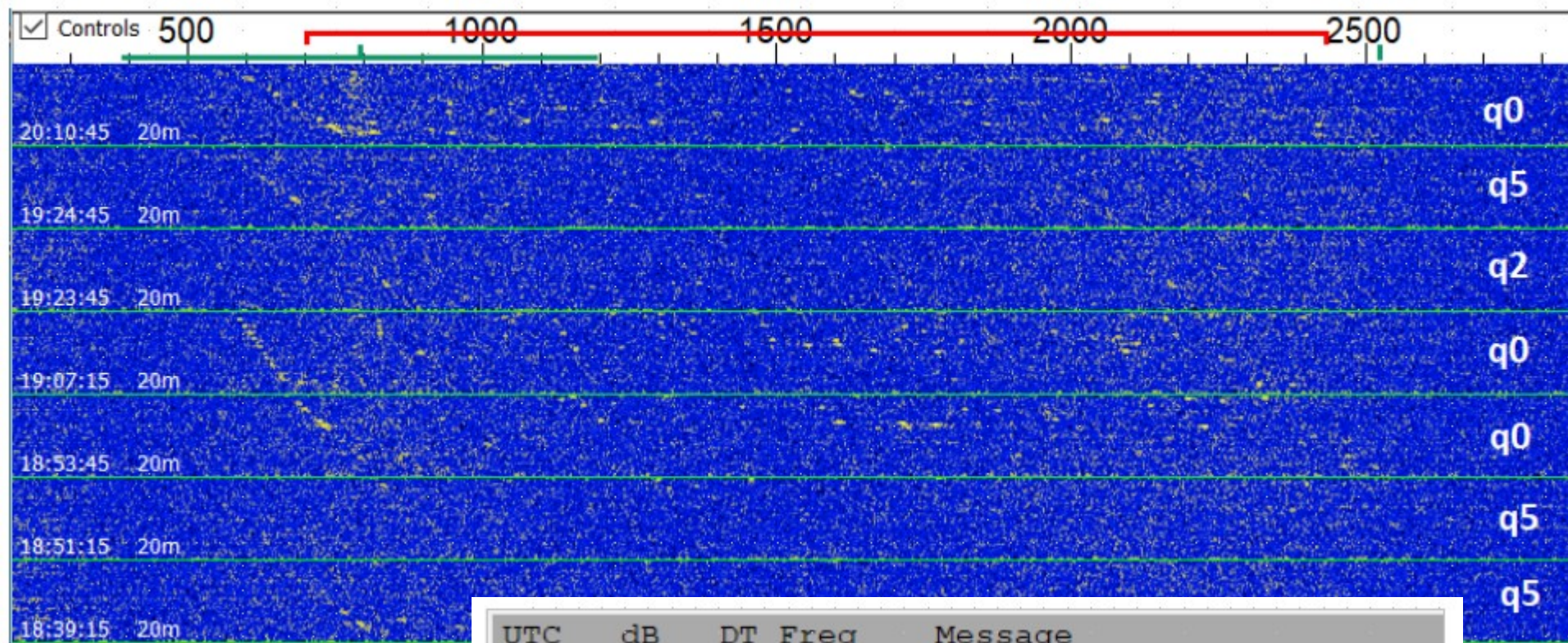




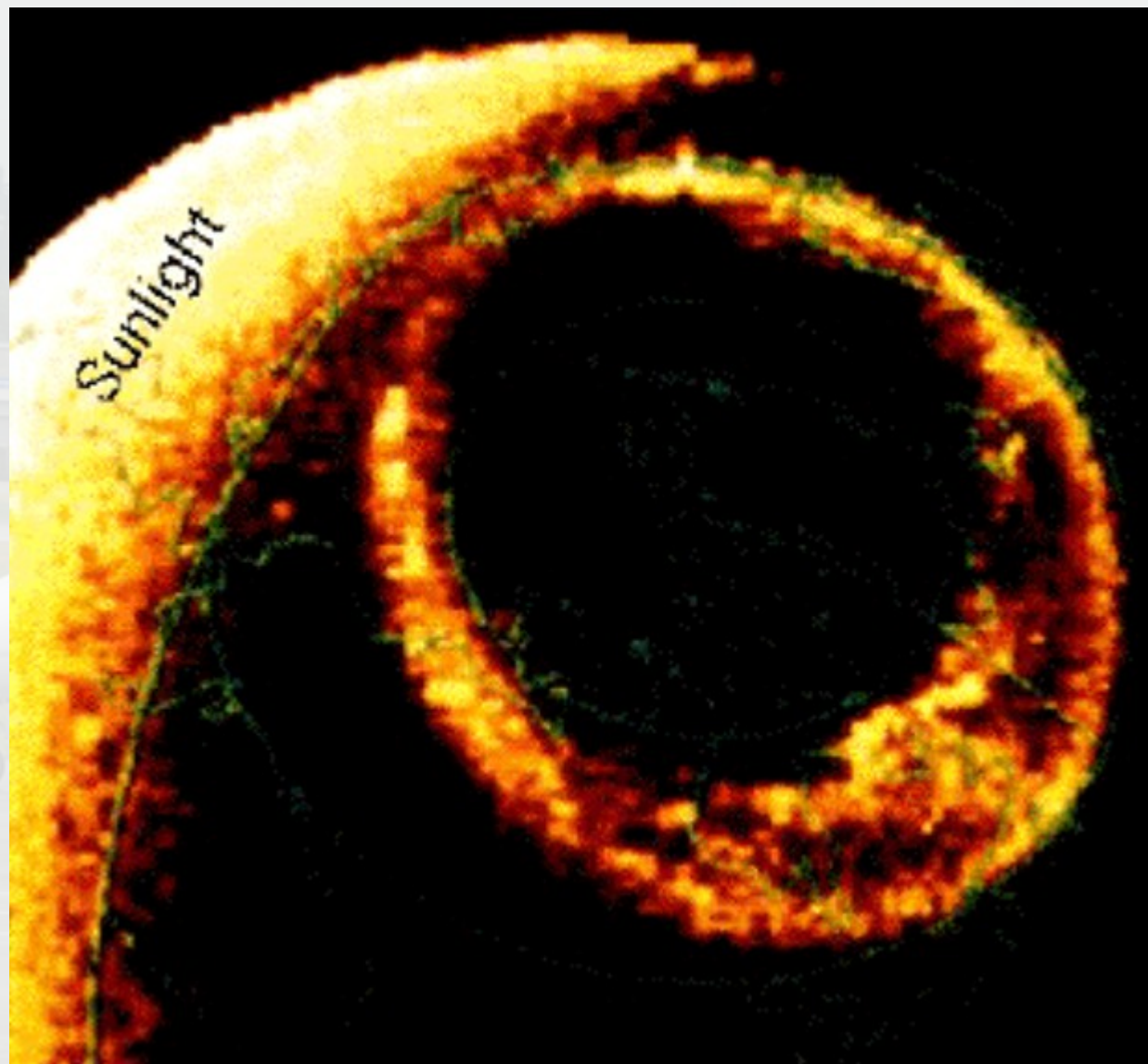


		Crossing angle			
Distance	Crossing Point	10 Degrees	20 Degrees	50 Degrees	90 Degrees
300 km	Centre of Path	-0.6 Hz/sec	-2.4 Hz/sec	-12.9 Hz/sec	-22.7 Hz/sec
500 km	Centre of Path	-0.3 Hz/sec	-1.3 Hz/sec	-7.6 Hz/sec	-13.6 Hz/sec
700 km	Centre of Path	-0.2 Hz/sec	-0.9 Hz/sec	-5.3 Hz/sec	-9.7 Hz/sec
900 km	Centre of Path	-0.1 Hz/sec	-0.7 Hz/sec	-4.1 Hz/sec	-7.6 Hz/sec
300 km	25% of Path	-0.7 Hz/sec	-3.0 Hz/sec	-17.0 Hz/sec	-30.3 Hz/sec
500 km	25% of Path	-0.3 Hz/sec	-1.7 Hz/sec	-9.9 Hz/sec	-18.2 Hz/sec

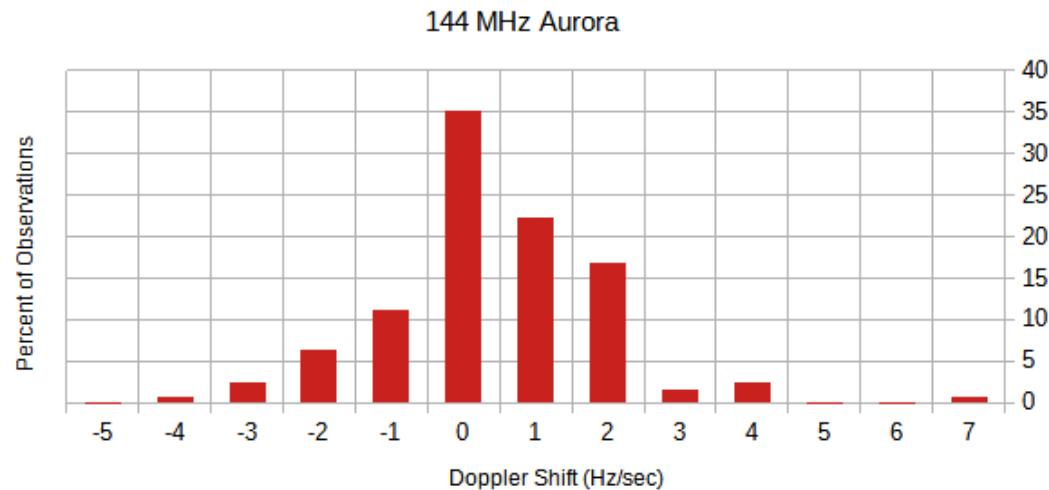
Fig 2: Doppler shifts for an aircraft speed of 800 km/hr at 10.368 GHz. For other aircraft speeds and frequencies the data can be proportioned.



UTC	dB	DT	Freq	Message
183915	-13	0.3	818	: W1FKF W3SZ -15 q5
185115	-14	0.3	978	: W1FKF W3SZ -15 q5
185345	-9	0.3	744	: W1FKF W3SZ -15 q0
190715	-9	0.3	624	: W1FKF W3SZ -15 q0
192345	-14	0.2	811	: W1FKF W3SZ -15 q2
192445	-13	0.2	738	: W1FKF W3SZ -15 q5
201045	-8	0.3	664	: W1FKF W3SZ -15 q0



Percent of Observations vs Doppler Shift (Hz/sec)



VK7MO has used Q65-15C for Auroral contacts on 144 MHz

(DUBUS 1/2023 pp94-95)

Nothing was seen on waterfall due to spreading, even though signals were quite strong (up to -4 dB)

?? 400 Hz spread ??

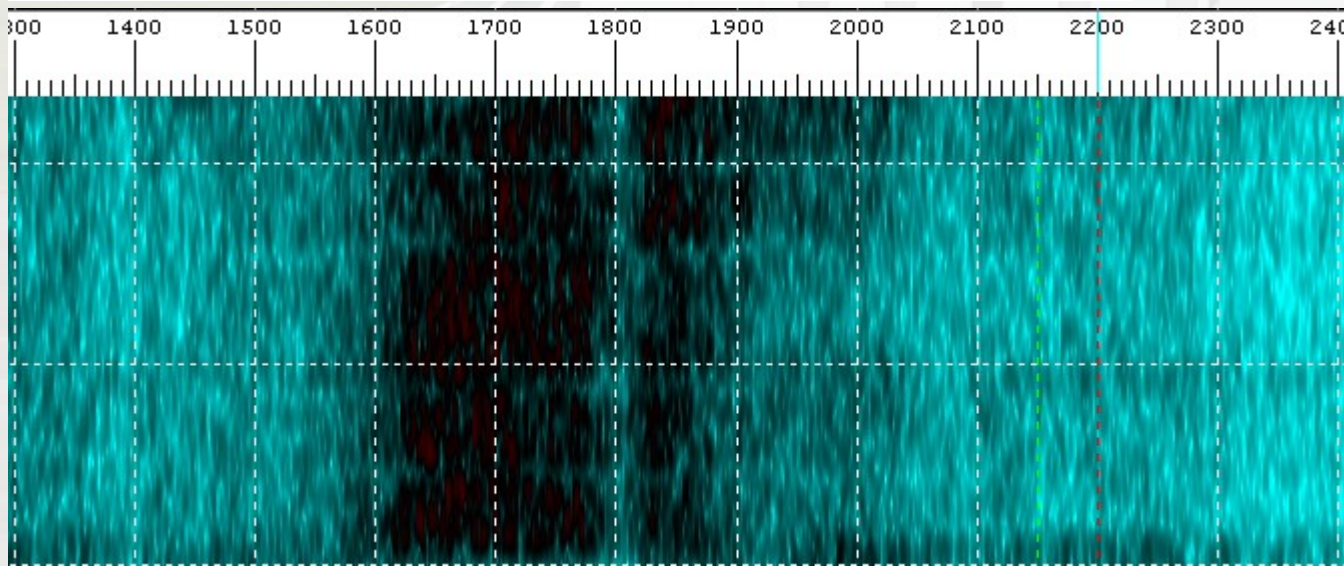
Parameters:

Used "Deep" decode (+10%)

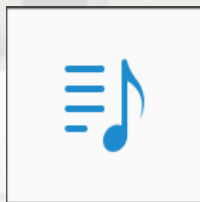
DX Call and Grid in DX Boxes (50% decodes vs 25% decodes)

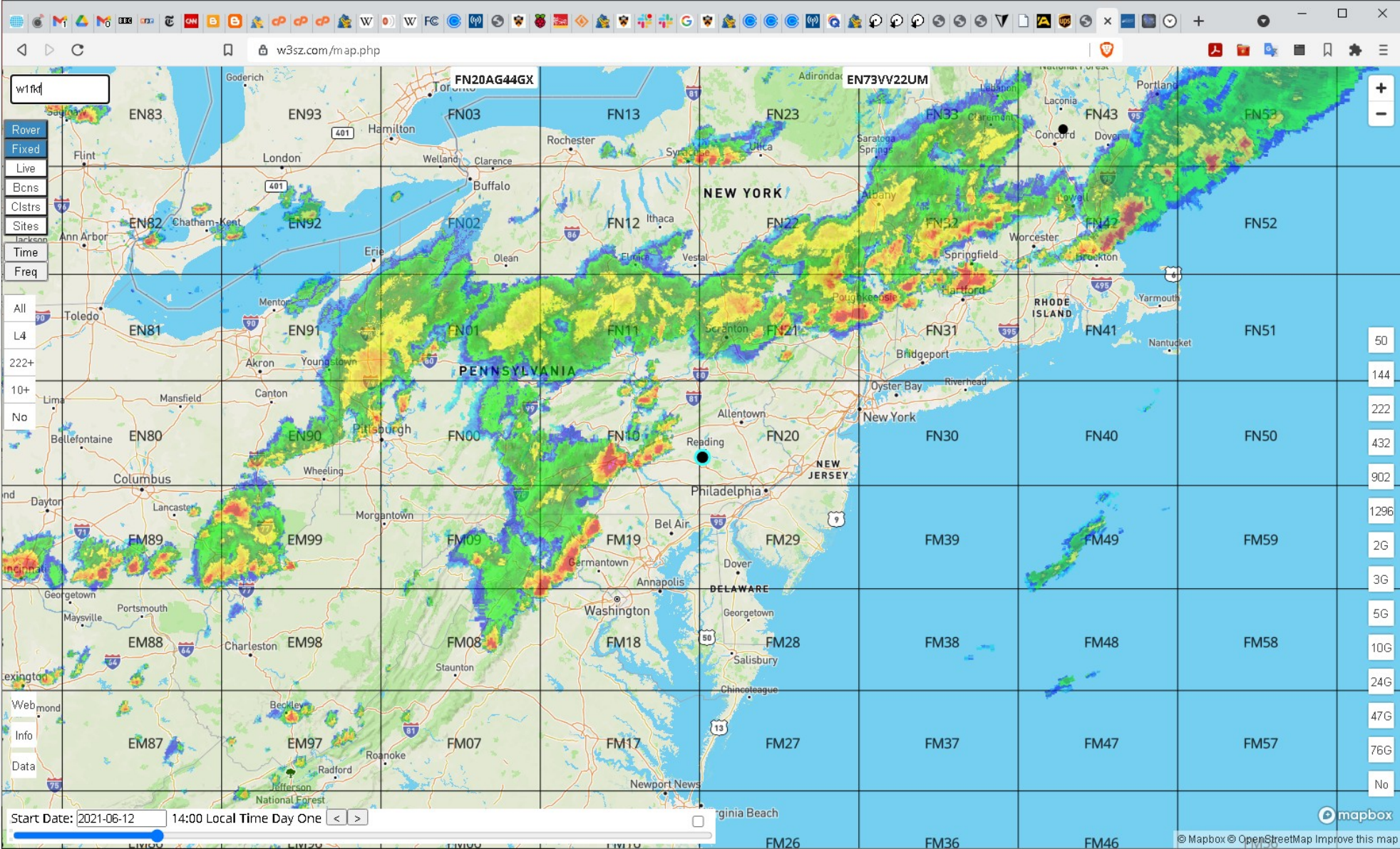
Tx Freq=700 Hz
Rx Freq=1000 Hz
Ftol=500 Hz
(300 Hz Dop shift)

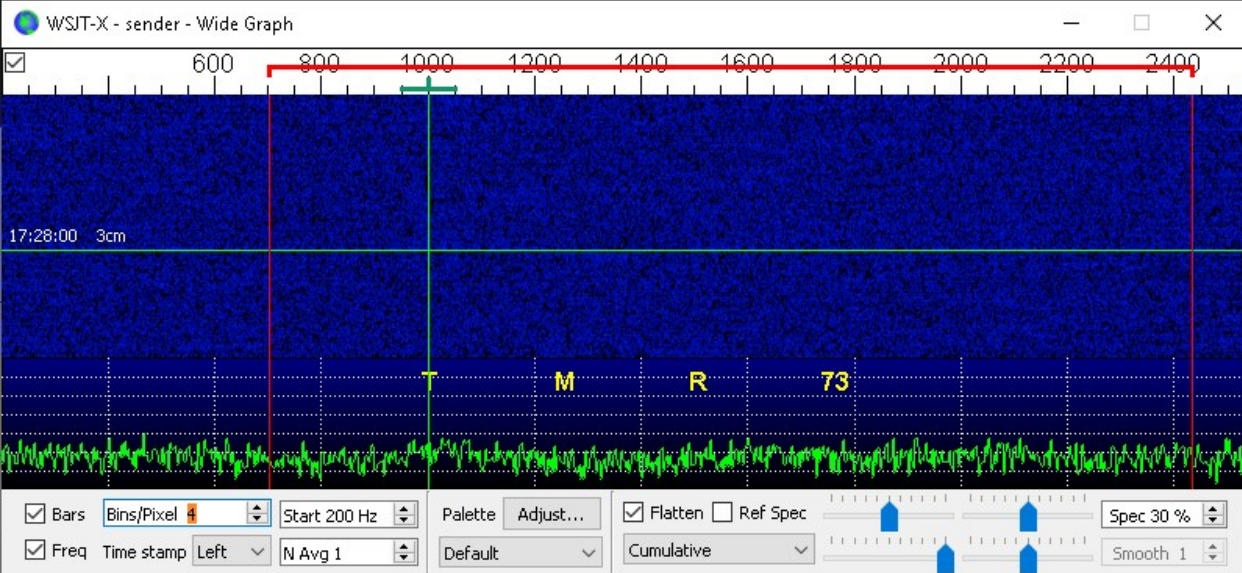
Play Aurora CW Audio Clip



WB1FKF Aurora CW



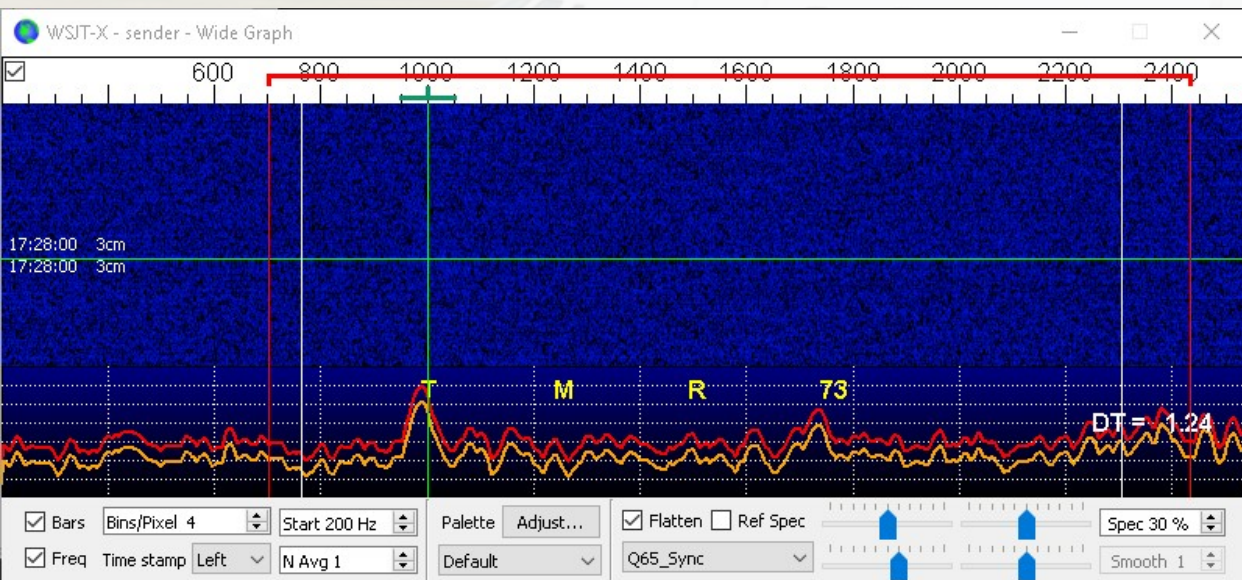




Rainscatter /Snowscatter –
 Spread of 50 Hz to more
 than 1kHz at 10 GHz

172800	-14	1.2	993	:	CQ	DL3WDG	JN68	q3
172800	-14	1.2	990	:	CQ	DL3WDG	JN68	q1
172800	-14	1.2	990	:	CQ	DL3WDG	JN68	q1

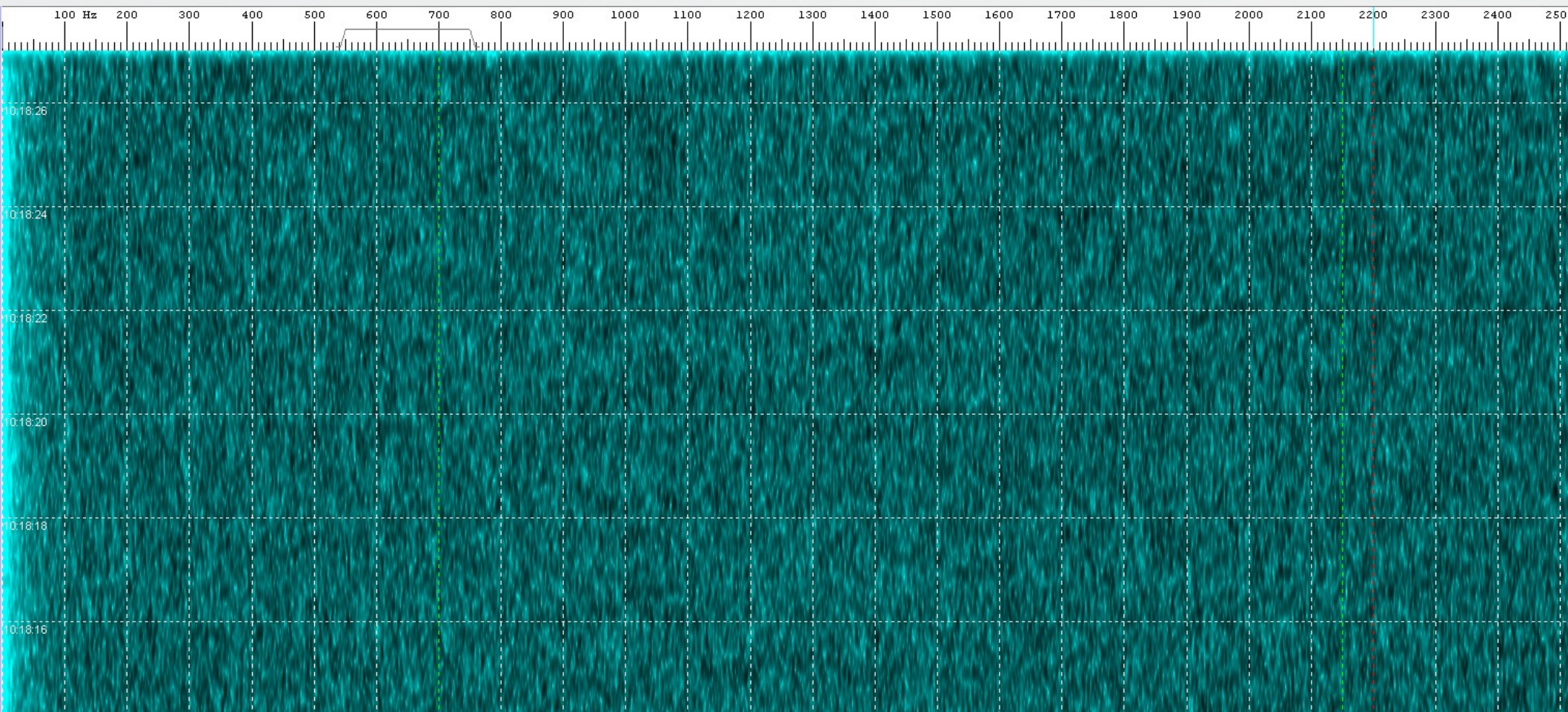
Q65-30D (same bin size and
 bandwidth as Q65-15C)



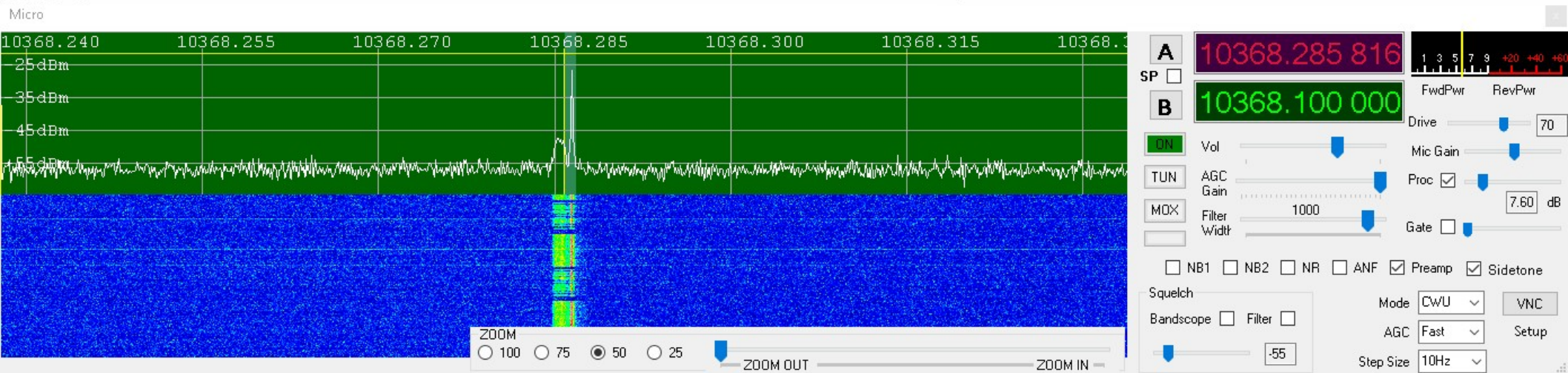
Play Audio Clip

DL3WDG 10 GHz beacon rainscatter

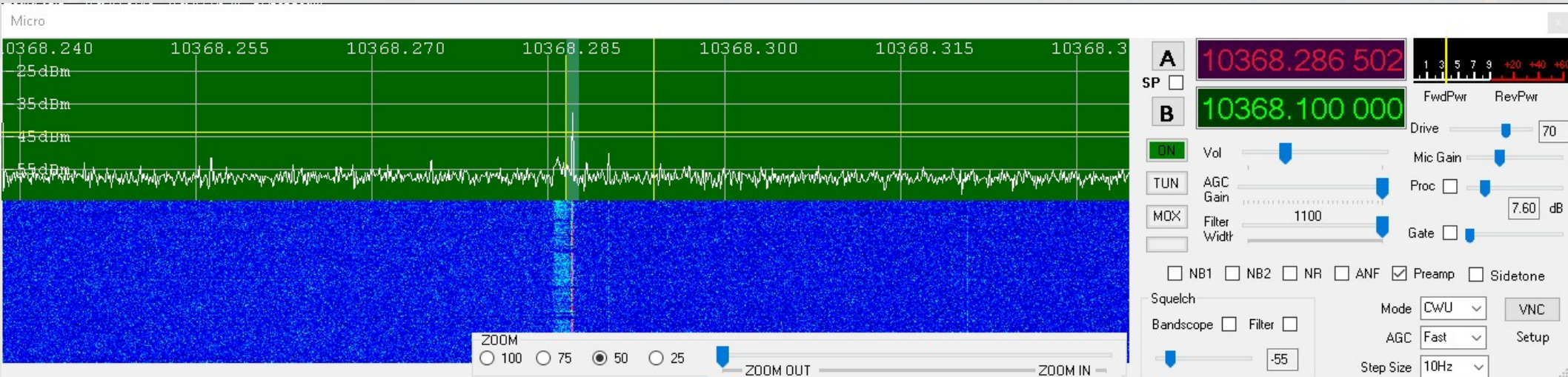




K3TUF 10 GHz beacon with snow scatter 1.9 kHz spreading



K3TUF 10 GHz beacon with rain scatter 1.4 kHz spreading



A white twin-engine turboprop aircraft, identified by the registration N1MM on its tail, is parked on an asphalt tarmac. The aircraft is viewed from a side profile, facing left. In the background, there are several large, light-colored hangars and a line of trees under a clear sky. The text "A few setup suggestions..." is overlaid in the center of the image.

A few setup suggestions...

Single-Period Decodes

UTC	dB	DT Freq	Message

Average Decodes

UTC	dB	DT Freq	Message

8 6 4 2 1.25 70 33 23 13 9 5G 10G 24G

☐ BP Log QSO Stop Monitor Erase Clear Avg Decode Enable Tx Halt Tx Tune ☒ Menus

3cm 10,368.153 000

☐ Tx even/1st

Tx 700 Hz

15A 15C 30B

60C 60D 60E

DX Call DX Grid

AC2AC FN27

F Tol 500

Rx 700 Hz

Submode C

Max Drift 50

Az: 360 778 km

Report 0

T/R 15 s

☐ Sh ☒ Auto Seq

CQ: First ☐ Tx6

Q65

2025 Nov 17
00:42:56

Generate Std Msgs

Next Now

Pwr

AC2AC W3SZ FN20

☒ Tx 1

AC2AC W3SZ +00

☐ Tx 2

AC2AC W3SZ R+00

☐ Tx 3

AC2AC W3SZ RR73

☐ Tx 4

AC2AC W3SZ 73

☐ Tx 5

CQ W3SZ FN20

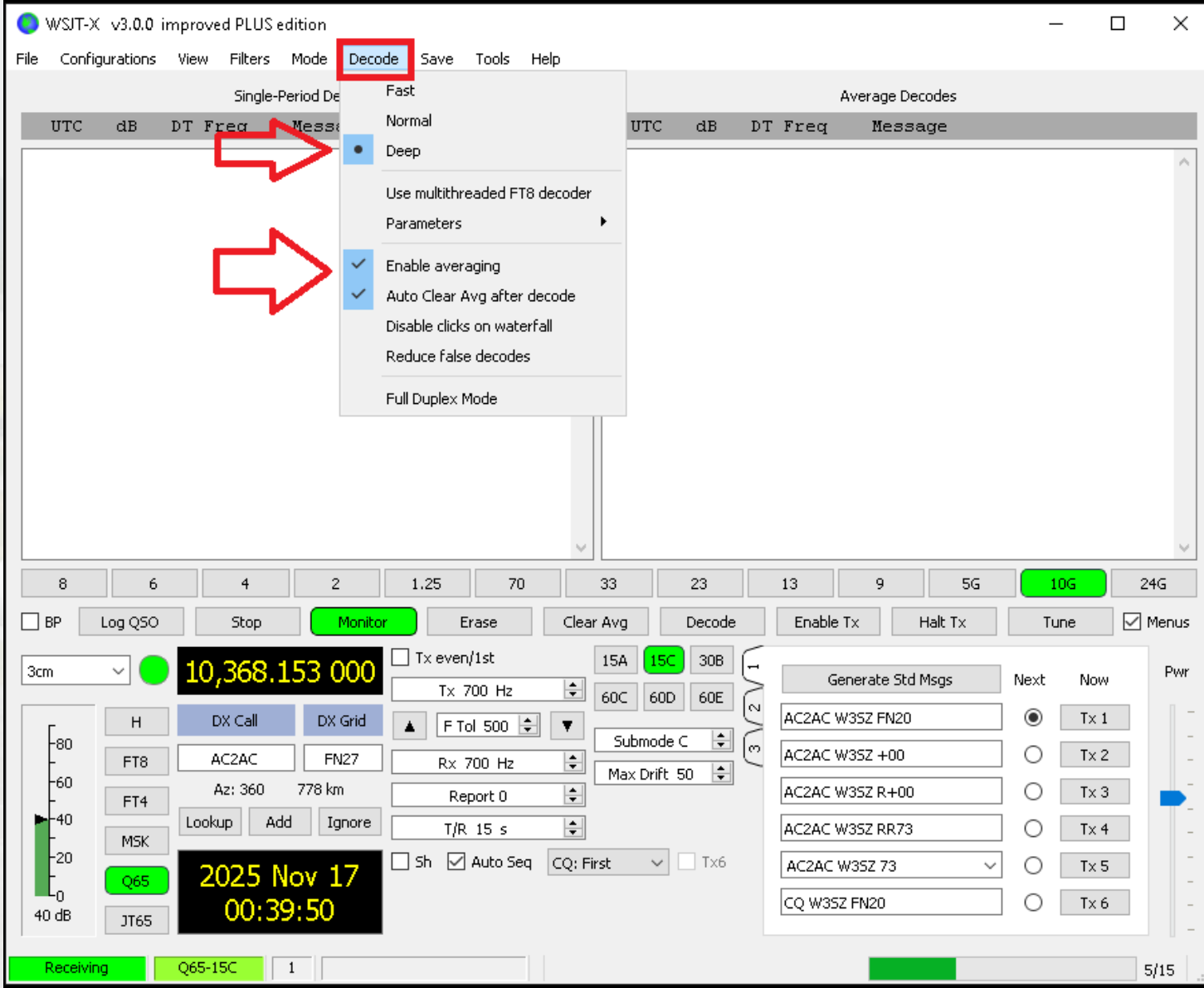
☐ Tx 6

Receiving

Q65-15C

1

11/15



Digital on the Microwaves

- Digital on the microwaves is NOT like digital on the lower 4
- You don't call CQ on 902 MHz and up
- Q65-15C is the go-to mode
- Do NOT use one of the “standard” frequencies for skeds; you want to avoid potentially getting interference
- ALWAYS put your QSO partner's call and grid into the DX Boxes on WSJTX (extra 3 dB)
- Make SURE you have Deep and Averaging enabled